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REPORT NO. [redacted]

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COUNTRY Czechoslovakia

DATE DISTR. 9 Dec. 1953

SUBJECT 1. High-Powered Vacuum Tubes with Horizontal Air-Cooling
2. Jamming Transmitters

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REFERENCES:

PLACE ACQUIRED [redacted]

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THIS IS UNEVALUATED INFORMATION

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1. The first air-cooled, high-powered electronic vacuum tube produced in Czechoslovakia was developed in the Tesla National Corporation in Prague-Vrsovice, SNB Alley, 55, in the beginning of 1950. It was called the "ACT 16". Up to the beginning of 1950 only water-cooled high-powered tubes were produced in Czechoslovakia. The Tesla plant in Prague-Vrsovice was the only plant in Czechoslovakia producing broadcasting transmitter tubes and special tubes for high and medium power (anode dissipation of 10 kw. and up) and some types of special low-powered tubes. The remaining types of low-powered tubes were produced in the Tesla National Corporation in Roznov pod Radhostem /N 49-28, E 18-08/.

2. The Tesla National Corporation in Prague-Hloubetin, Julius Fucik Works, was the only plant in Czechoslovakia that produced broadcast transmitters. This plant requested the Tesla-Vrsovice plant to develop an air-cooled high-power vacuum tube, since an air-cooled tube is less expensive and easier to operate than a water-cooled tube. The chief persons dealing with this problem in the Hloubetin plant were Ing. KLIKA and VACKER, who were employed as scientific workers in the research and development department.

3. The type CAT 9 (20 kw., water-cooled) was the type of tube from which the ACT 16 was developed. The planned production of CAT 9 was 130 for 1951 and 130 for 1952. This type of tube was produced only at the Tesla-Vrsovice plant. The production dropped to 83 units for 1953, because more of these tubes had been produced in the previous years than had been planned. The production of CAT 9 represented from four to five per cent of the total production of the Tesla-Vrsovice plant.

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About 80 to 90% of the CAT 9 type tubes produced were used as oscillators and modulators for the old middle and short-wave broadcast transmitters operating in Czechoslovakia. The remaining 10 to 20% of these tubes were used in generators for high-frequency heating equipment in the Tesla Roznov plant. (Generators for high-frequency heating were also produced in Czechoslovakia, by two different firms, one of them was the former Ing. Stivin Firm, located somewhere in Bohemia.) This equipment in the Tesla Roznov plant was of Netherlands origin and Netherlands type TA 12/20 tubes were formerly used there. Starting with the second half of 1949, import of the type TA 12/20 tube stopped and CAT 9 type tubes were used instead. The CAT 9 tube was of a different and better design than the type TA 12/20 tube, but it was not so well made. The performance characteristics of these two types of tubes were about the same. The CAT 9 carried a guarantee for 2,500 hours of operation. The price of the CAT 9 tube was 20,300 crowns each. It is possible that this price was reduced in conformity with the general effort to reduce the price of certain types of tubes.

4. The air-cooled ACT 16 type tube had an anode dissipation of 15 kw. The operating characteristics and the uses of this tube were the same as for CAT 9. The first five units of the ACT 16 were developed in the second half of 1950. These tubes had axial cooling fins (vertical) of the same design as was known and used in the West. The general effort in Czechoslovakia to decrease copper consumption resulted in a redesign of this tube which featured horizontal cooling fins (at right angles to the axis of the tube). this feature of horizontal cooling fins is unique and original to Czechoslovakia. /Drawings of this improved ACT 16 tube are attached as Annexes A through F. The dimensions given on the drawings are in millimeters and correspond to the real production dimensions./

5. The copper fins were wound onto the core from a single piece of copper strip approximately 0.5 mm. thick and 21 mm. wide. The fins were spaced by a wire of one millimeter diameter wound onto the core between successive windings of the fin-stock. The wire and fin-stock copper were soldered to the core. Manufacturing difficulties were encountered which caused short life.

   a. Poor soldering prevented the heat from dissipating evenly; the heat melted the solder and eventually destroyed the tube.

   b. The winding of the copper stripping was not evenly done and consequently the outside diameter of the cooling fins was not exactly the same from one fin to the next. Also the sheet iron container enclosing the fins was not of constant diameter because of its welded construction. These two factors caused air to circulate vertically in some instances through the gaps between the fins and the container. This reduced the efficiency of the air-cooling system.

   c. The copper band used was too thin and was occasionally oxidized by heat. The cooling fin was very easily damaged because of its thinness.

6. The air flow was lateral through the fins, but vertical through the five-channel ducting system. Air was drawn in from the top and exhausted at the bottom by a blower motor. In 1953 plans were made to manufacture the container out of cast aluminum. Since the container was considered part of the transmitter, it was manufactured in the transmitter plant (Tesla-Hloubetin) not know if production of ducting out of cast aluminum actually was begun.

Two types of ducting systems were tried: (1) ducting channels untapered from top to bottom; and (2) tapered ducting channels. The tapered channels were twice as wide at top (intake) as they were at the bottom (exhaust) and proved to be more satisfactory than the untapered channels. Tapered ducting channels were used from the first half of 1951. The cover, or uppermost part of the cooling assembly, was manufactured from cast aluminum and served to admit the air coming into the radiator and also served to cool the spot where the glass envelope is sealed to the metal. The covering further enabled the electric field coming from the anode to pass through the glass envelope at right angles. This is necessary to avoid strain of the glass.

7. The planned production of the ACT 16 was 75 units for 1951 and 215 for 1952. In reality only 35 units in 1951 and 200 units in 1952 were produced. The planned production for 1953 was 842, [redacted] this quantity could be produced because it was not beyond the production capacity of the plant. The price was 29,300 crowns each. The total quantity of ACT 16 tubes produced represented from six to eight per cent of the total production of the plant in 1952 and about 13% in 1953. TRESOHLAVY, a Communist, and Maly FRANTISEK, chairman of the plant's Communist Party organization in 1952, were the chief technicians concerned with the production of this tube. It was the general opinion in the plant that the minimum quantity of copper used in the production would result in a short life of this tube. No guarantee had been fixed for this tube. The average life of this tube in 1952 and 1953 was from 500 to 1,000 hours. 50X1

8. It was planned to use ACT 16 tubes for new transmitters which had been produced by the Tesla-Hloubetin plant since 1950. [redacted] 50X1
50X1 [redacted] in 1950 that the Tesla-Hloubetin plant had a number of transmitters under serial production for jamming purposes. All the ACT 16 tubes produced during 1951 were shipped to the "Transmitter Karlovy Vary" and "Transmitter Pilsen-Kosutka". [redacted] these 50X1 were the true names of transmitters which were located somewhere in the Karlovy Vary and Pilsen regions and were serving as jamming transmitters. The Karlovy Vary transmitter was set in operation in the middle of 1951 and the Pilsen-Kosutka transmitter in the fall of 1951.

9. The ACT 201 was the second Czechoslovak high-powered tube to be produced with air-cooling. The design of its cooling system was the same as the ACT 16, but larger. The ACT 201 had 50 kw. anode dissipation. The lifetime of this type of tube was not yet established, but it was very low, not more than a few hundred operation hours. 50X1 It was planned to produce 53 units of this type for 1952, but the first prototype was not tested until the middle of 1952, and further tests took place in the beginning of 1953. [redacted]
50X1 [redacted] It was planned to produce 180 units for 1953. ACT 201 was to be used with a new type of broadcast transmitter which had been under construction at the Tesla-Hloubetin plant since the
50X1 beginning of 1952. [redacted] only one transmitter of this new type was in construction there at that time. [redacted] planned to use this transmitter as a jamming transmitter or not. ACT 201 was developed from CAT 201, an 80 kw. tube with water-cooling which was used for the middle and short-wave Czechoslovak broadcast 50X1 transmitters. The planned and actual productions of CAT 201 tubes were practically the same — 17 units for 1951 and 52 units for 1952. Production of 147 units was planned for 1953. The price of this tube was 33,900 crowns each.

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Annexes:

A. General Over-all Diagram of ACT 16

B. Detailed Diagram of the Radial Heat Radiator

C. Five Channels Ducting with Tapering Channels

D. Five Channels Ducting with Untapered Channels

E. Detailed Diagram of the Covering

F. Diagram of Air Circulation in the Five-Channel Ducting with Tapering Channels

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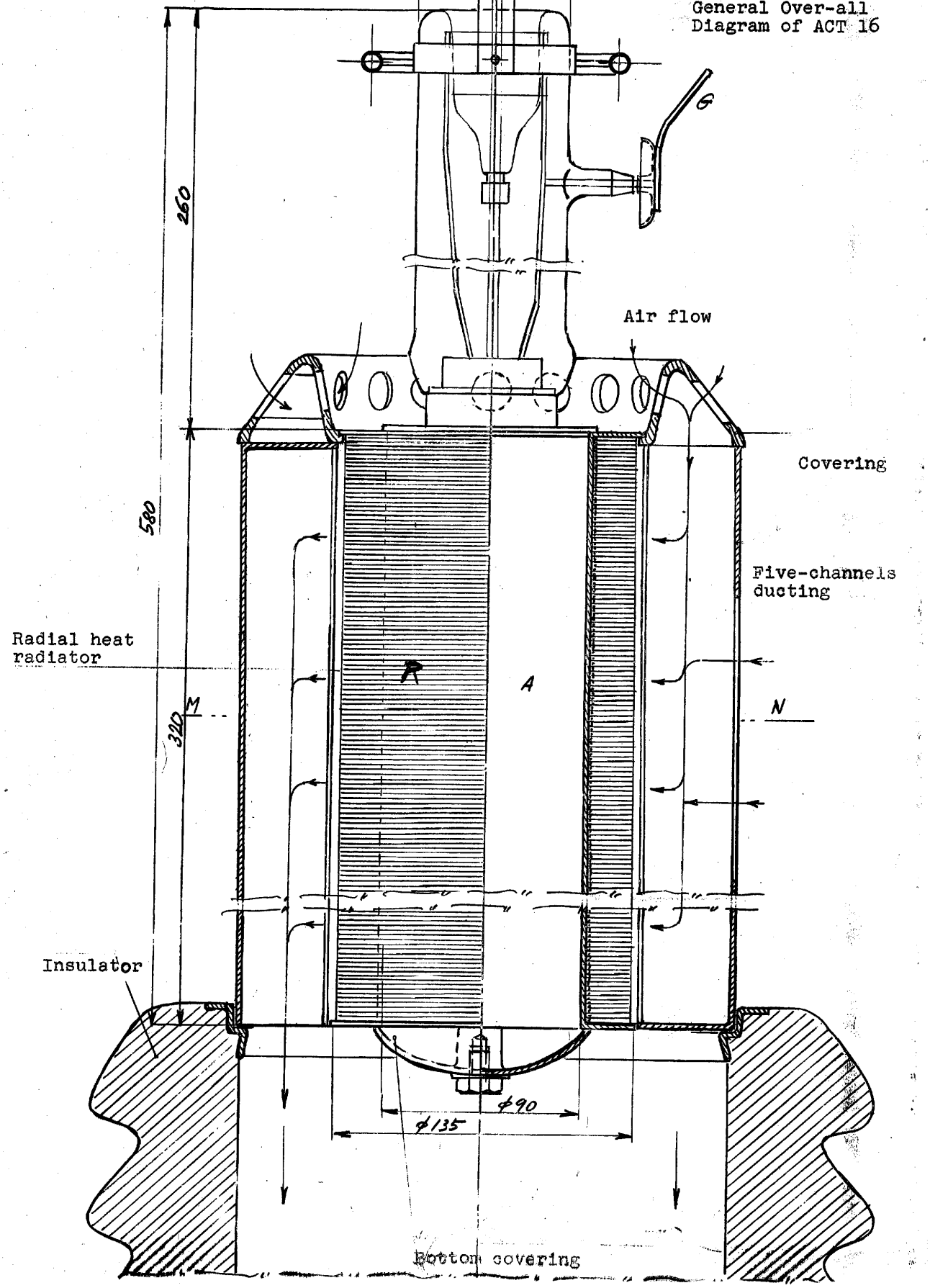
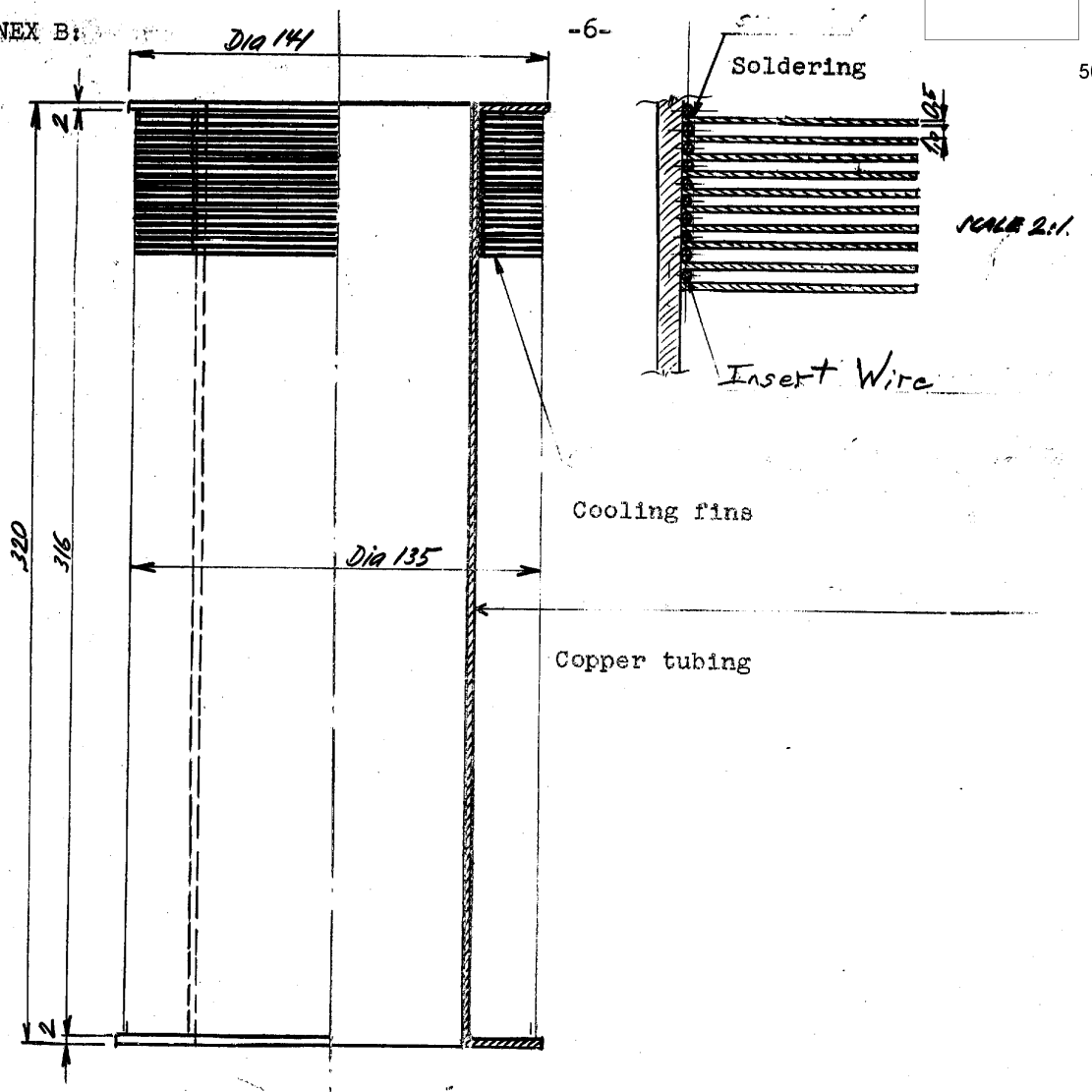
SCALE 1:2.

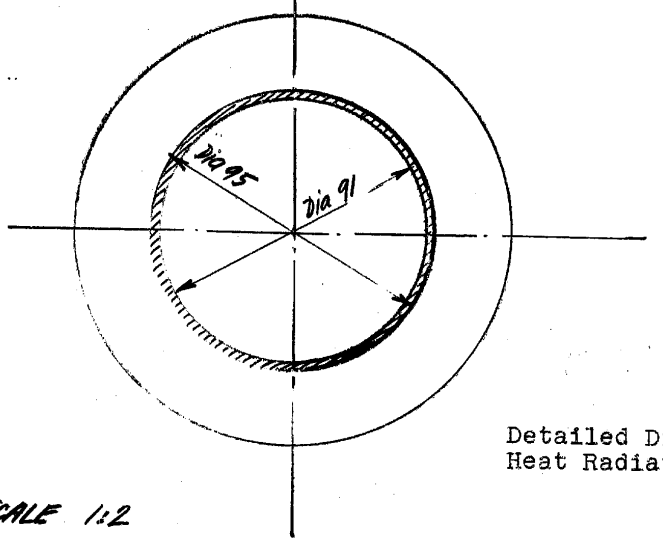
ANNEX A:

General Over-all
Diagram of ACT 16



ANNEX B:





Detailed Diagram of the Radial Heat Radiator

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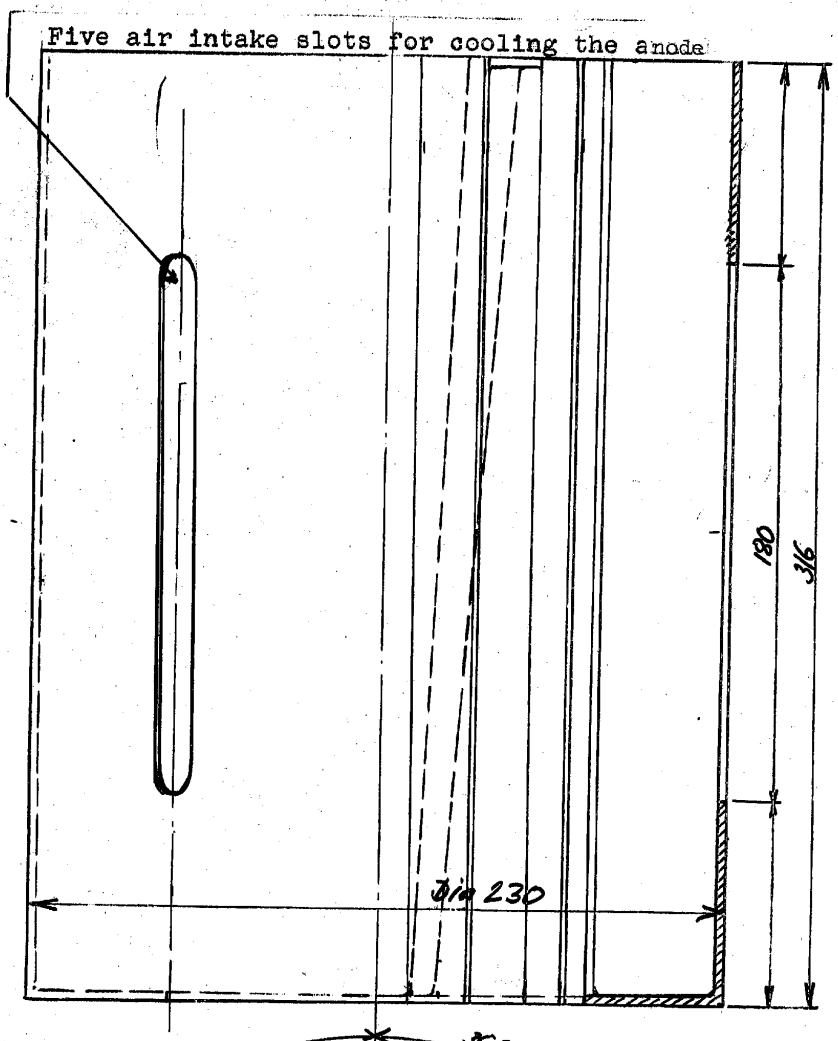
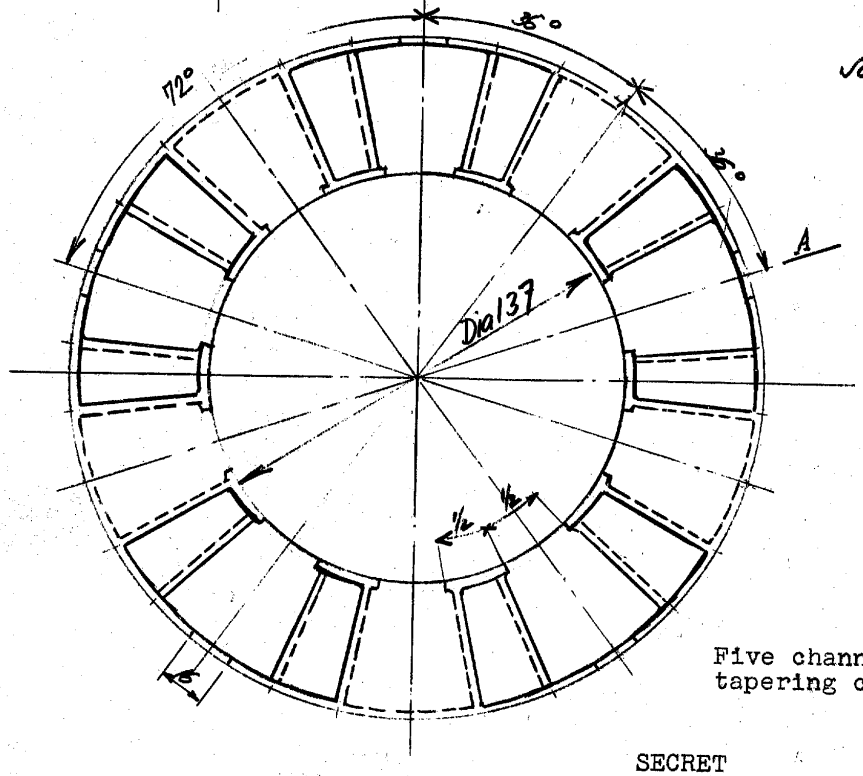
Five air intake slots for cooling the anode





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Five channels ducting with tapering channels

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ANNEX D:

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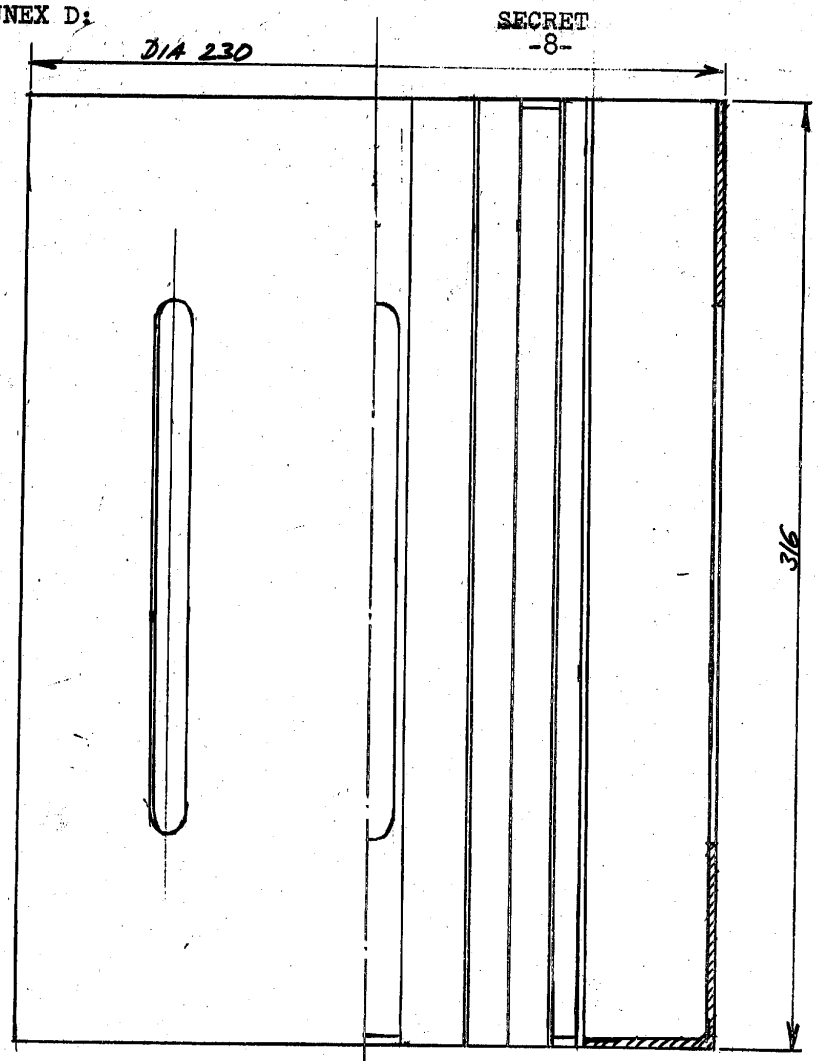

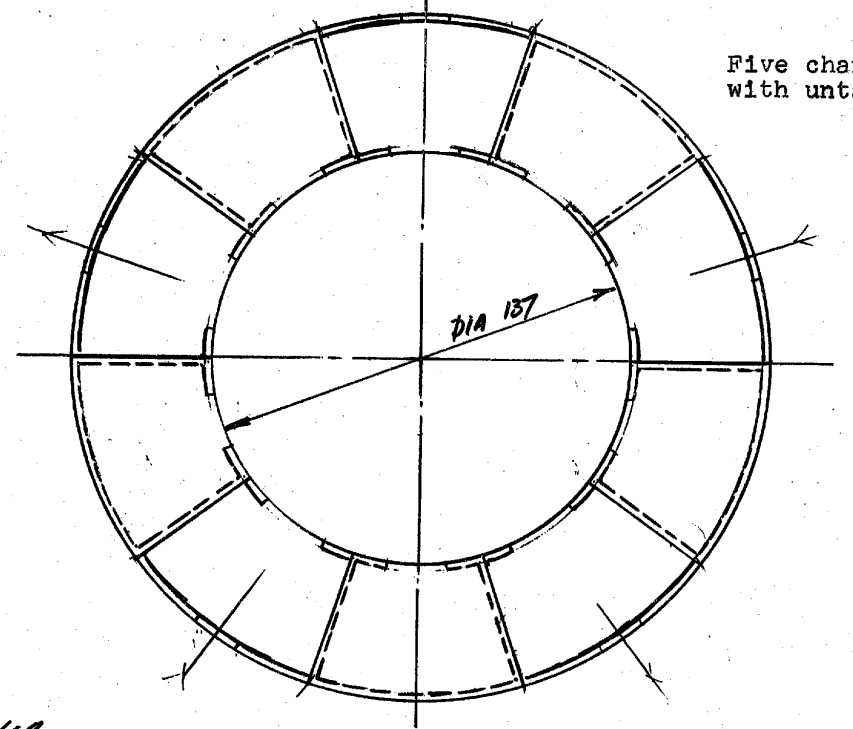

Five channels ducting
with untapered channels

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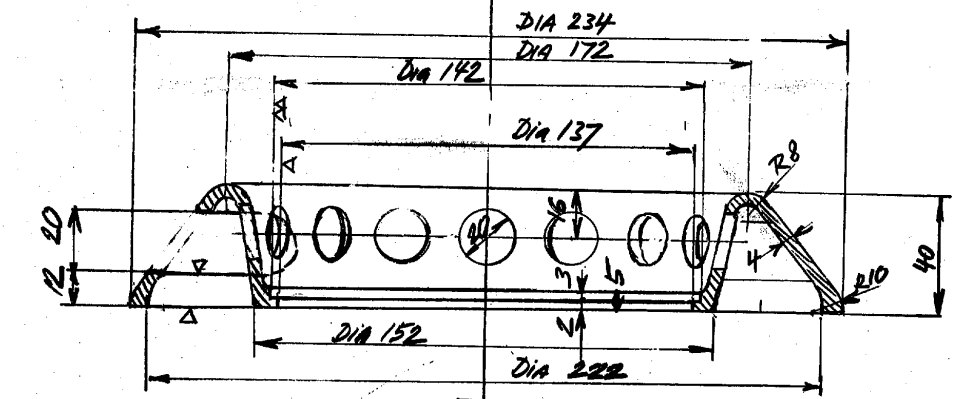
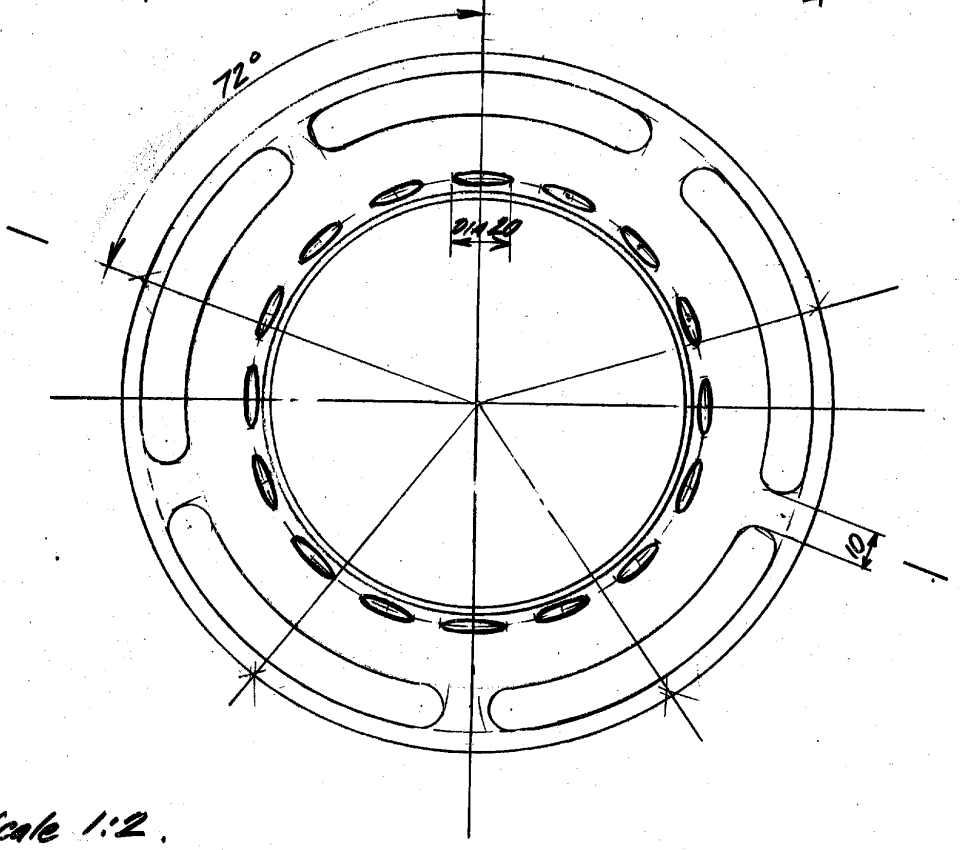
ANNEX E:

Detailed Diagram of the Covering

Covering





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ANNEX F:

Diagram of Air Circulation in the Five-Channel Ducting with Tapering Channels